Taranaki Basin Miocene Channel Systems and their Impact on Prospectivity

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Abstract

Exploration permit PEP 53374 is located in the offshore Central Taranaki Basin adjacent to the Maui Petroleum Mining License. A complex system of Middle Miocene submarine channel complexes has been recognised and mapped in detail on high quality 3D seismic data revealing a variety of channel morphology, geometry and postulated fill lithology. The relationship between the uppermost channel complex and the marine Waiauan age (latest middle Miocene) Moki A sands has led to the development of a prospect in PEP 53374 whereby erosion and backfilling with shales and muds is postulated to have resulted in an effective seal to the Moki A sandstones.

Deposition of the Moki A submarine fan sandstones is believed to be widespread over PEP 53374 with a provenance to the south and southeast of the Maui area. Sandstones within the Moki A are fine to very fine grained with a mixed quartz and lithic composition. Porosity ranges between 10% and 25% and permeabilities from 0.1md to 200md. Sandy log character is typified by blocky intervals of low gamma ray, minor neutron-density crossover and slight decrease in sonic velocities interbedded with high gamma ray shales. This log character translates to a high amplitude seismic response making the reservoir intervals easy to identify.

The last submarine channel system to affect the Moki A sandstones is oriented northwest to southeast and its fill appears to have a seismic signature consistent with fine-grained facies deposition. Interpretation of these channels on 3D seismic data show a degree of periodicity that supports the presence of sealing facies channel fill.

Mechanisms for stratigraphic trapping within the Moki A sandstone formed by the combination of faulting and backfilled erosional channels are presented along with analogues from Asia where the presence of mud fill in channels is related to their periodicity and where mud filled channels serve as an effective trapping mechanism, eg. in the multi-tcf Shwe Field, Bay of Bengal. Research into modern analogues would help to constrain the perceived risk that such channels might be prone to sand rather than sealing fine-grained facies.